

G1 the deflector being coupled with the tubular body facing and spaced axially away from the outlet and intersecting the central axis, the tubular body having a K factor greater than 9, the deflector having a face portion generally orthogonal to the central axis and a canopy portion being coupled to the face portion at a first canopy end and extending generally along the central axis away from the outlet towards a free end, the first canopy end being spaced at a first distance from the outlet, the free end being spaced from the outlet at a second distance greater than the first distance, and the deflector being shaped and positioned to transform water discharged horizontally from the outlet upon release of the closure by the trigger into a spray pattern of water droplets dispersed over a generally horizontal, generally rectangularly-shaped extended coverage area of more than one hundred square feet located on one side of the sprinkler in an amount and with a distribution effective to control an ordinary hazard fire in the coverage area.

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5. (Twice Amended) The sprinkler of claim 1, wherein the generally rectangular shaped coverage area receiving water from said sidewall sprinkler is up to about two hundred and fifty six square feet in size.

G2 6. (Twice Amended) The sprinkler of claim 5, wherein the generally rectangularly shaped coverage area receiving water from said sidewall sprinkler is up to about three hundred and twenty square feet in size.

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G3 7. (Twice Amended) The sprinkler of claim 1, wherein the generally rectangularly shaped coverage area is more than three hundred and twenty and up to about three hundred eighty four square feet in size.

8. (Twice Amended) The sprinkler of claim 7, wherein the generally rectangularly shaped coverage area is about three hundred and eighty-four square feet in size.

9. (Amended) The sprinkler of claim 1, wherein the coverage area is at least sixteen feet by

sixteen feet and up to about sixteen feet by twenty four feet.

G3 10. (Amended) The sprinkler of claim 9, wherein the coverage area is about sixteen feet by eighteen feet in size.

11. (Amended) The sprinkler of claim 10, wherein the coverage area is about sixteen feet by twenty feet in size.

G4 14. (Twice Amended) The sprinkler of claim 1, wherein the face portion is positioned facing and spaced axially away from the outlet along the central axis so as to perpendicularly intersect the column of water issuing from the outlet along the central axis and the canopy portion being supported on one side of the face portion spanning the face portion, the canopy portion being generally parallel with the central axis and perpendicular to the face portion, the face portion and canopy portion being configured to deliver water to the coverage area in a density of at least 0.15 and up to about 0.20 gallons per minute/ft<sup>2</sup> to achieve a generally planar spray pattern of water droplets generally parallel to a major side of the canopy portion facing the central axis, the spray pattern extending up to about twenty feet beyond the face portion and up to about eight feet to either lateral side of the central axis when the sprinkler is positioned with the central axis horizontal and the major side of the canopy portion facing the central longitudinal axis being generally horizontal and above the central longitudinal axis whereby said ceiling sprinkler is effective in controlling ordinary hazard fires over an extended coverage area of more than one hundred square feet and up to about three hundred eighty four square feet when pressurized to supply water at a rate of between about 0.15 and about 0.20 gallons per minute/ft<sup>2</sup> times the size of the coverage area in square feet.

G5 15. (Amended) The sprinkler of claim 14, wherein the coverage area is at least three hundred and twenty square feet and up to about three hundred eighty four square feet.

66 20. (Amended) A sidewall automatic fire sprinkler comprising a generally tubular body with a central passageway and a central axis, one end of the passageway forming an outlet at one end of the tubular body, the tubular body having a K factor greater than  $9 \text{ gpm}/(\text{psi})^{1/2}$ , a closure at one end of the tubular body closing the passageway, a thermally responsive trigger positioned to releasably retain the closure at the outlet closing the passageway before activation of the trigger by heat, and a deflector at a discharge end of the sprinkler, the deflector being coupled with the tubular body facing and spaced axially away from the outlet so as to intersect the central axis, the deflector having a face portion oriented generally perpendicularly with respect to the central axis and located on one lateral side of the central axis and a canopy portion oriented generally parallel to the central axis and being located on another lateral side of the central axis opposite the one lateral side, the canopy portion being coupled to the face portion at a first canopy end and extending generally along the axis away from the outlet towards a free end, the first canopy end being spaced at a first distance from the outlet, the free end being spaced from the outlet at a second distance greater than the first distance, the deflector further being configured, with the sprinkler in a normal operating orientation with the central axis generally horizontal and the canopy portion generally centered over the face portion, to deflect water discharged through the outlet after activation of the sprinkler substantially uniformly over a coverage area generally rectangular in shape, the coverage area being more than one-hundred square feet in size and being located generally symmetrically with respect to the central axis, the coverage area extending from the deflector in a direction away from the orifice.

21. (Amended) The sidewall automatic fire sprinkler of claim 20 wherein the deflector is further configured, with the sprinkler in the normal orientation with the canopy portion generally horizontal and above the face portion of the deflector, to deliver after release of the closure, water supplied through the tubular body at a rate of at least 0.15 and up to about 0.20 gallons per minute per square foot for each square foot of the coverage area, sufficiently uniformly over the coverage area to control an ordinary hazard fire located anywhere within the coverage area with only the supplied water, with the coverage area being more than one hundred square feet and up

to about three hundred eighty four square feet and located at a height of only three feet below the canopy portion of the deflector.

22. (Amended) The sidewall automatic fire sprinkler of claim 21 wherein the coverage area is up to sixteen feet wide and at least sixteen and up to about twenty four feet long.

23. (Amended) The sidewall automatic fire sprinkler of claim 22 wherein the coverage area is about sixteen feet wide and more than sixteen and up to about twenty four feet long.

24. (Twice Amended) An extended coverage sidewall automatic fire sprinkler comprising:

a generally tubular body with a central passageway being disposed along a central axis and forming an outlet at an end of the generally tubular body, the central passageway having a K factor greater than 9 and up to about 14;

a closure located at the end of the generally tubular body;

a trigger positioned to releasably retain the closure to occlude the outlet;

two frame arms coupled to the generally tubular body proximate the outlet, the two frame arms being located on a plane which intersects the central axis;

a deflector being coupled with the tubular body by the two frame arms along the central axis and spaced axially away from the outlet to transform water discharged horizontally from the outlet upon release of the closure by the trigger into a spray pattern of water droplets dispersed over a generally horizontal, generally rectangularly-shaped extended coverage area of at least two hundred fifty-six and up to about three-hundred eighty four square feet on one side of the sprinkler in an amount and with a distribution effective to control an ordinary hazard fire in the coverage area; and

wherein the deflector includes a face portion oriented generally perpendicular with respect to the central axis, the face portion consisting of a single flow opening, a canopy portion oriented generally parallel to the central axis, the canopy portion having a generally flat planar surface substantially parallel to the plane on which the frame arms are located, and two support

G7 arms coupling the canopy and the face, to define the single flow opening through the face portion of the deflector.

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25. (Amended) An extended coverage sidewall automatic fire sprinkler comprising:

G8 a generally tubular body with a passageway being disposed along an axis and forming an outlet at an end of the generally tubular body, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a closure proximate the end of the generally tubular body:

a trigger that retains the closure to occlude the outlet until actuation of the trigger; and

a deflector being coupled with the tubular body and spaced axially away from the outlet, the deflector including a face portion oriented generally perpendicular with respect to the axis and a canopy portion oriented generally parallel to the axis, the canopy portion having a surface distal to the outlet consisting of a generally flat surface generally perpendicular to a plane passing through the axis.

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G9 29. (Amended) The sprinkler of claim 25, further including only two support arms coupling the flat canopy and the face portion of the deflector, the two support arms being spaced apart by about 1.5 inches.

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G10 31. (Amended) The sprinkler of claim 30, wherein the canopy portion comprises a distal surface generally parallel to the longitudinal axis above an area to be protected, the distal surface consisting of a generally flat surface disposed on the plane, the plane being oriented in one orientation generally parallel to or oblique to the axis.

32. (Amended) The sprinkler of claim 30, wherein the amount of water being discharged is at a density of at least 0.15 and up to about 0.20 gallons per minute per square feet.

33. (Amended) The sprinkler of claim 32, wherein the amount of water being discharged is at a density of about 0.20 gallons per minute per square feet.

34. (Amended) The sprinkler of claim 33, wherein the extended-coverage area is greater than 100 square feet and up to about 384 square feet.

G10 35. (Amended) The sprinkler of claim 33, wherein the water flow from the outlet is at least 38 gallons per minute and up to about 48 gallons per minute.

36. (Amended) The sprinkler of claim 33, wherein the extended-coverage area including a length and a width, each of the length and the width being greater than 10 feet and up to about 24 feet.

37. (Amended) The sprinkler of claim 36, wherein the extended coverage including a length and a width, one of the length and the width being at least 16 feet and up to about 24 feet such that the extended-coverage area is at least 256 square feet and up to about 384 square feet.

38. (Amended) The sprinkler of claim 37, wherein the extended-coverage area is at least 320 and up to about 384 square feet.

G11 40. (Amended) The sprinkler of claim 39, wherein the K factor is about 14.

42. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:

G12 a generally tubular body with a passageway disposed along an axis, one end of the passageway forming an outlet at one end of the tubular body, the tubular body having a K factor greater than 9, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in

pounds per square inch gauge;

a closure positioned proximate the outlet so as to occlude the passageway;

a trigger that retains the closure at the outlet until actuation of the trigger; and

G12 a deflector being coupled to the tubular body and spaced from the outlet, the deflector transforming water being discharged horizontally from the outlet, upon release of the closure by actuation of the trigger, at a density of at least 0.15 gallons per minute per square feet, the deflector having a face portion generally orthogonal to the axis and a canopy portion being coupled to the face portion at a first canopy end and extending generally along the axis away from the outlet towards a free end, the first canopy end being spaced at a first distance from the outlet, the free end being spaced from the outlet at a second distance greater than the first distance.

43. (Amended) The sprinkler of claim 42, wherein the deflector transforms water being discharged from the outlet so as to provide a density of about 0.20 gallons per minute per square feet.

44. (Amended) The sprinkler of claim 43, wherein the deflector transforms water being discharged from the outlet at a rate of at least 38 gallons per minute and up to about 48 gallons per minute.

45. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:  
a generally tubular body defining a passageway along an axis and forming an outlet at an end of the generally tubular body, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a frame arm being coupled to the end of the generally tubular body, the frame arm being

located generally on a horizontal plane, which is generally parallel to an area to be protected;

a closure proximate the end of the generally tubular body;

a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and

612 a deflector assembly having a face portion generally orthogonal to the axis and a canopy portion being coupled to a face portion at a first canopy end and extending generally along the axis away from the outlet towards a free end, the first canopy end being spaced at a first distance from the outlet, the free end being spaced from the outlet at a second distance greater than the first distance, the deflector assembly being coupled to the generally tubular body by the frame arm so as to be spaced from the outlet along the axis so that when the heat responsive trigger is actuated, the closure is positioned to allow a flow of fluid to issue horizontally from the outlet of the generally tubular body over an extended-coverage area.

46. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:

a generally tubular body defining a passageway along an axis and forming an outlet at an end of the generally tubular body, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a frame arm being coupled to the end of the generally tubular body, the frame arm being located generally on a vertical plane, which is generally perpendicular to an area to be protected;

a closure proximate the end of the generally tubular body;

a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and

a deflector assembly being coupled to the generally tubular body by the frame arm so as to be spaced from the outlet along the axis so that when the heat responsive trigger is actuated, the closure is positioned to allow a flow of fluid to issue horizontally from the outlet of the generally tubular body over an extended-coverage area, the deflector having a face portion



extending generally orthogonal to the axis and a canopy portion having a surface distal to the outlet and generally parallel to the longitudinal axis above an area to be protected, the distal surface consisting of a generally flat surface generally perpendicular to a plane passing through the longitudinal axis, the canopy portion being coupled to the face portion by only two support arms.

47. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:

612 a generally tubular body defining a passageway along an axis, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a closure proximate the end of the generally tubular body;

a heat responsive trigger that retains the closure to occlude the passageway until actuation of the trigger; and

a deflector being coupled to the tubular body and spaced from the outlet, the deflector transforming water being discharged horizontally from the outlet, upon release of the closure by actuation of the trigger, over a generally horizontal extended coverage area so as to control a fire in the coverage area, the deflector having a face portion extending generally orthogonal to the axis, the face portion consisting of a single flow opening and a canopy portion being coupled to the face portion by only two support arms defining the single flow opening therebetween.

48. (Amended) An extended coverage, horizontal sidewall automatic fire sprinkler comprising:

a generally tubular body defining a passageway along an axis, the passageway having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge;

a closure positioned proximate the outlet so as to occlude the passageway;

a heat responsive trigger that retains the closure to occlude the passageway until

actuation of the trigger; and

a deflector being coupled to the tubular body and spaced from the outlet, the deflector transforming water being discharged horizontally from the outlet upon release of the closure by actuation of the trigger over a generally horizontal extended coverage area so as to control a fire in the coverage area, the deflector having a face portion extending generally orthogonal to the axis and a canopy portion, the face portion consisting of a single flow opening, the canopy portion being coupled to the face portion by only two support arms symmetrical to the axis, the two support arms defining the single flow opening having a distance of about 1.5 inches between proximal surfaces of each support arm.

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49. (Amended) The sprinkler according to any one of claims 45-48, wherein the deflector transforms water at a rate of at least 38 and up to about 48 gallons per minute discharged horizontally from the outlet at a density of at least 0.15 and up to about 0.20 gallons per minute per square feet over the extended-coverage area.

50. (Amended) A fire protection system for a structure, the structure having an area to be protected, the area being disposed generally on a first plane and at least one wall disposed generally on a second plane, which is generally perpendicular to the area, the system comprising:

at least one pipe in communication with a fluid supply; and

at least one sprinkler being coupled to the at least one pipe and projecting from the at least one wall toward a boundary of the area to be protected, the at least one sprinkler including:

a generally tubular body with a passageway disposed along an axis, one end of the passageway forming an outlet at one end of the tubular body, the tubular body having a K factor greater than 9 and up to about 14, where the K factor represents a flow of fluid in gallons per minute through the passageway divided by the square root of the pressure of fluid fed to the generally tubular body in pounds per square inch gauge; and

a deflector being coupled to the tubular body and spaced from the outlet, the deflector deflects water being discharged through the outlet after activation of the sprinkler substantially

G12 uniformly over an extended-coverage area, the deflector having a face portion oriented generally perpendicularly with respect to the axis and a canopy portion oriented generally parallel to the axis, the canopy portion having a fluid deflecting surface portion furthest from the axis above the outlet, the fluid deflecting surface portion consisting of a generally flat planar surface rectangular in cross-section.

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Please add new claim 62:

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G13 62. (New) The sprinkler of claim 1, wherein the canopy portion comprises a surface distal to the central axis, the distal surface consisting of a generally flat surface parallel to the central axis.

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